

## REMARKS

Claims 1-4 have been canceled, and new claims 5-10 have been added. The canceled claims have been replaced by corresponding new claims in order to improve the grammatical and idiomatic expression. The specification has been amended editorially by way of a Substitute Specification for improved clarity, including correction of grammatical errors and nonidiomatic expression. The Abstract of the Disclosure has been replaced by a new Abstract in accordance with applicable requirements. No new matter has been added in the new specification claims or abstract. Entry of the amendments and examination of the amended application are respectfully requested. Please enter the amendments before calculating the filing fee.

Respectfully submitted,

June 13, 2005  
Date

  
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Terminal Connection Apparatus of Electric Device TERMINAL CONNECTION  
APPARATUS FOR ELECTRICAL DEVICES

Technical Field- Background of the Invention

1. Field of the Invention

The present invention relates to a terminal connection apparatus for bridging between terminals of neighboring electric devices (e.g., contactor, open/close device).electrical devices (e.g., contactors (relays), on/off devices).

Prior Art

When a motor is positive/negative operated. According to a known arrangement, when a motor is normal/reverse-operated, or when one power source is connected to two loads in a switching manner, or when two power sources are connected to one load in a switching manner, two electromagnetic contactors (relays) or two open/closesimilar on/off devices are provided so as to be physically adjacent to each other, and a terminal connection apparatus is used for bridging between the terminals by aof these devices using terminal connectionconductor.

Fig. 5 is a wiring diagram of a tripolarconductors. Figs. 5A, 5B and 5C illustrate wiring diagrams of a three-pole electromagnetic contactor in various applications using such a terminal connection apparatus.

First, Fig. 5 (A)Fig. 5A shows the connection wherein which two electromagnetic contactors 1 are used to perform the positive/negative normal/reverse operation of a motor. Here, with regards to the power source side, the space between the two terminals 1-+, the space between the two terminals 3-3, and the space between the two terminals 5-5 are bridged by the terminal connection conductors 2, 3, and 4to be bridged in the order of phases (i.e., the same phases are bridged) and, with regardsbridged). With regard to the load side, the space between terminals 2-6,2 and 6, the space between the two

terminals 4-4, and the space between terminals 6-26 and 2 are bridged by the terminal connection conductors 5, 6, and 7 to be bridged in the order in which the phases are switched (i.e., switched, i.e., to be bridged so that two phases of the three phases are switched). As interchanged. As is well known, a tri-polar three-phase AC motor can provide normal rotation/reverse rotation by switching two phases among three of the phases of R, S, and T. Thus, when treating the condition in which the electromagnetic contactor 1 at the left of Fig. 5(A) being 5A is in the "ON" "ON" condition is assumed as normal rotation, then reverse rotation is provided when the right side is in the "ON" "ON" condition.

Similar switching also can be provided when the power source side and the load side are directly switched.—are switched directly.

Next, Fig. 5(B) shows that Fig. 5B shows two electromagnetic contactors 1 are used to switch two loads A and B and B, in which the power source side is bridged in the order of the phases. When the left side of Fig. 5(B) is turned ON, then the load A is supplied with the power source and, when the right side is turned ON, then the load B is supplied with the power source. Fig. 5(C) shows that power. Fig. 5C shows two electromagnetic contactors 1 are used to switch two power sources A and B and B, in which the load side is bridged in the order of the phases. When the left side of Fig. 5(C) is turned ON, the power source A is supplied to the load and, when the right side is turned ON, the power source B is supplied to the load.

Fig. 6 shows Figs 6A and 6B show an example in which a conventional terminal connection apparatus is used to provide a reversible type electromagnetic contactor used for the positive/negative for the normal/reverse operation of a motor. Fig. 6(A) shows the motor, where Fig. 6A is a side view and Fig. 6(B) shows the 6B is a front view. In Fig. 6, two Two electromagnetic contactors 1 are provided on an attachment base 8 so as to be adjacent to each other and are interlocked by a mechanical interlock apparatus 9 so that the two contactors are not turned ON at the same time. As shown, the space between the terminals at the power source side (upper side) is bridged by the terminal

connection conductors 5 to 7 in the order of the switching of the phases, while the space between the terminals at the load side (lower side) is bridged by the terminal connection conductors 2 to 4 in the order of the phases.

Figs. 7A, 7B and 7C are respectively a side view, a front view and a lower face view of a terminal connection conductor, Fig. 7 and Fig. 8 respectively show different conventional examples illustrating such as the terminal connection conductor 2 in Fig. 6, for example. In the drawings, "(A)" is the side view, "(B)" is the front view, and "(C)" is the lower face view. First, in Fig. 7, the Figs. 6A and 6B, in the exemplary conventional terminal connection apparatus. The terminal connection conductor 2 consists of a U-shaped conductor punched out of a plate material, both ends of which are bent to have at a right angle to provide a terminal section 2a. The space between the terminal sections 2a, 2a is covered by an insulation material 10. In Fig. 7, the The insulation material 10 is applied, for example, with a polyethylene resin immersion coating or a powder insulation coating.

The Figs. 8A, 8B and 8C are respectively a side view, a front view and a lower face view of another example of the terminal connection conductor 2 of Fig. 8 in Figs. 6A and 6B. Here, terminal connection conductor 2 has the same structure as that of Fig. 7 Figs. 7A, 7B and 7C, but the former is different from the latter in that the insulation material 10 is formed by a tube that contracts when being subjected to heat. In Fig. 6, Figs. 6A and 6B, for the purpose of saving space, the terminal connection conductor 3 is provided to have a Q-like shape and the terminal connection conductor 6 is provided to have a strip-like shape, and they are connected to the terminal connection conductors 2 and 4 and the terminal connection conductors 5 and 7 so as to be perpendicular thereto, as shown in Fig. 6.

Spanish Patent Publication No. ES2081243 discloses a different conventional technique regarding a terminal connection apparatus for bridging between the terminals of two electric devices provided to be adjacent to each other, in a terminal connection apparatus for bridging the terminals of two electrical devices provided to be adjacent to

each other. This apparatus is designed such that an electric insulation element having a groove for guiding an electric wire is provided, and the groove is inserted with an electric wire for bridging between the terminals. This apparatus is designed so that an electrical insulation element having a groove for guiding an electric wire is provided, and an electric wire is inserted in the groove for bridging between the terminals.

The terminal connection conductor of Fig. 7 insulation-coated by an immersion coating or a powder insulation coating can be applied, as shown in the drawing, with an insulation coating up to the root of the terminal section. If the terminal connection conductor of Figs. 7A, 7B and 7C is coated for insulation by an immersion coating or a powder insulation coating, the insulation coating can be applied, as shown, up to the root of the terminal section, but has a problem in that the insulation coating material needs to be dried for a long time, causing a poor workability. However, a problem arises in that the insulation coating material needs to be dried for a long time, so it has poor workability.

In contrast, the terminal connection conductor of Fig. 8 using a thermal contraction tube has, when compared to the conventional example of Fig. 7, a superior workability for the insulation coating. In contrast, in the terminal connection conductor of Figs. 8A, 8B and 8C using a thermal contraction tube, when compared to the conventional example of Figs. 7A, 7B and 7C, the insulation coating has superior workability, but such a thermal contraction tube tends to have wrinkles during the contraction (the corner section where the conductor is bent in particular tends to have a complicated shape due to the wrinkles). However, such a thermal contraction tube tends to develop wrinkles during contraction, and the corner section where the conductor is bent in particular tends to have a complicated shape due to the wrinkles. In view of this, when a thermal contraction tube is used, conventional techniques have prevented such a conductor bend section from being insulation-coated as much as possible so that the insulation coating can be provided to the middle part of the U-shaped section (see Fig. 8). In view of this, when a thermal contraction tube is used, conventional techniques have prevented such a conductor bend section from being maximally insulation-coated, so that the insulation coating is provided only in the middle part of the U-shaped section (see

Figs. 8A, 8B and 8C). However, this causes the conductor to be exposed in a wider area, thus causing a risk of a short circuiting accident caused when this exposed part is adhered with a conductive foreign material (e.g., scraps of electric wire) or an electric shock accident due to the contact with a finger, for example. Thus, the conductor is exposed in a wider area, which runs the risk of a short-circuit when this exposed part comes in contact with a conductive foreign material (e.g., scraps of electric wire), or of causing an electric shock if contacted by a finger, for example. The terminal connection apparatus for reversible operation of Fig. 6 also had a problem in that the wiring tends to be carried out incorrectly because six terminal connection conductors are connected separately. The terminal connection apparatus for reversible operation of Figs. 6A and 6B also has a problem of incorrect wiring because six terminal connection conductors must be connected separately.

On the other hand, regarding the apparatus according to Spanish Patent Publication No. ES2081243 in which an electric wire is inserted to the groove of an electric insulation element, exposed electric wiring is contained in a narrower space which thus reduces the risk of electric shock accidents. On the other hand, with the apparatus according to Spanish Patent Publication No. ES2081243 in which an electric wire is inserted to the groove of an electrical insulation element, exposed electric wiring is contained in a narrower space, which reduces the risk of electric shocks. This apparatus also has an advantage in that the wiring can be arranged with more precision because terminals can be connected after all electric wires are retained by electric insulation elements. This apparatus also has an advantage that the wiring can be arranged with more precision because terminals can be connected after all electric wires have been retained by electrical insulation elements. However, grooves inserted with electric wires require different route patterns in accordance with the wiring type (e.g., order of phase, phase switching), thus causing a problem in that an increased number of types of electric insulation elements renders the layout more complex. However, grooves in which electric wires are inserted require different routing patterns in accordance with the wiring type (e.g., order of phase, phase switching), thus increasing the complexity of the layout process. A deeper groove for providing an enhanced insulation also tends to cause the

~~deformation of a resin-formed electric insulation element, thus causing a problem where an electric wire sometimes cannot be inserted into the groove. A deeper groove for providing an enhanced insulation also tends to cause deformation of the resin-formed electrical insulation element, which may cause a problem in inserting the wiring into the groove. Such a groove also causes a risk in which the insulation of an electric insulation element may be deteriorated due to dust or the like because the groove in the electric insulation element is in an "open" condition before being inserted with an electric wire.~~

Such a groove also creates a risk that the insulation of an electrical insulation element may deteriorate from dust or the like, because the groove in the electrical insulation element is in an "open" condition before an electrical wire is inserted.

The present invention intends to solve these problems. It is an objective of the present invention to improve the insulation of the terminal connection conductor, to prevent an incorrect wiring operation, and to simplify the wiring work and the management of components. The present invention is intended to solve these problems. It is an objective of the invention to improve the insulation of the terminal connection conductor, to prevent incorrect wiring, and to simplify the wiring work and the management of components.

#### Disclosure of the Invention-Summary of the Invention

In order to solve the above problems, according to the invention of Claim 1, a terminal connection apparatus of an electric device ~~or electrical devices~~ is provided in which the terminal connection apparatus has terminal connection conductors for a plurality of phases for bridging between the terminals of two electric devices provided to be adjacent to each other and, ~~this~~ electrical devices. The terminal connection conductor has, at both ends thereof, terminal sections connected at both ends for connection to the terminals of the electric devices and consists of a U-shaped conductor in which ~~electrical~~ devices. The terminal connection conductor is U-shaped and the space between these terminal sections is covered by an insulation material, wherein an insulation case ~~for~~ material. An insulation case, housing the terminal connection conductors, collectively surrounds the terminal connection conductors for a plurality of phases, except

for the terminal sections is provided and this insulation case houses therein the terminal connection conductors for unitization.

According to the invention of Claim 1, the terminal connection conductors for a plurality of phases are collectively housed in the insulation case for sections, to provide unitization. This enables the insulation of the terminal connection conductors to be completely protected from the exterior. This also can adopt, Also, since each of the terminal connection conductors can be insulation covered with insulation in the minimum range required for interphase insulation, the minimum this permits use of a thermal contraction tube to minimize the amount of insulation covering utilizing a thermal contraction tube, thus utilized and simplifying the insulation covering operation.

The terminal connection conductors Further, the terminal connection conductors for a plurality of phases are connected while being after having been unitized by the insulation case, which thus suppressing an incorrect wiring operation. On the other hand, reduces the likelihood that the wiring operation will be performed incorrectly. Further yet, the insulation case is provided to may have a box-like shape to collectively house therein the terminal connection conductors for a plurality of phases, and thus can be widely used regardless of the wiring type (e.g., phase order wiring, phase switching order wiring). Furthermore, the insulation case is sealed by a cover body, thus preventing the insulation from being deteriorated due to the ingress deteriorating due to an ingress of dust or the like.

According to the invention of Claim 2, in the invention of Claim 1, another aspect of the invention, the terminal connection conductors consisting are formed of a plate material, and are provided to be parallel to one another in the plate thickness direction direction of plate thickness. This allows the entire configuration to be retained more securely when compared to than that of a terminal connection conductor of the prior art using an electric wire, and also enables the apparatus to have a thinner shape be thinner.

According to the invention of Claim 3, in the invention of Claim 2, still another aspect of the invention, with the insulation case consists of including a box-shaped body having at the upper face an opening, and having at the upper edge a notch engaged with the terminal section of the an opening at the upper face, and with terminal connection conductor and a plate-shaped cover body attached to this body by conductors of a plate material provided to be parallel to one another in the direction of plate thickness, the box-shaped body has notches at the upper edge for the respective conductors. Each notch is engaged with a terminal section of the respective terminal connection conductor. The case also includes a plate-shaped cover body engaging the box-shaped body and covering the opening at the upper face. The terminal connection conductors that are inserted in the body and in which the terminal sections thereof are projected via the notches, are pressed by the cover body to be fixed. This allows an insulation case having a simple structure to enable the terminal connection conductors to be positioned according to need, and the complete protection of the insulation by surrounding the terminal connection conductors, being engaged therewith and covering the opening and, the terminal connection conductor that is inserted to the body and in which the terminal section is projected via the notch is pressed by the cover body to be fixed. This allows an insulation case having a simple structure to enable the terminal connection conductors to be positioned according to need, and the complete protection of the insulation by surrounding the terminal connection conductors.

According to a further aspect of the invention, the terminal connection conductors are covered by thermal contraction tubes. This covering may be provided in the range required for interphase insulation, while for the exposed terminal connection conductor parts, the insulation case provides protection. According to the invention of Claim 4, in the invention of Claim 2, the terminal connection conductor is covered by a thermal contraction tube. This covering may be provided in the range required for interphase insulation, and for the exposed terminal connection conductor parts, an insulation case is provided.

### Brief Description of the Drawings

Fig. 1 is an exploded perspective view of a phase switching terminal connection apparatus illustrating an embodiment of the present invention.

Fig. 2 is an exploded perspective view of a phase order terminal connection apparatus illustrating an embodiment of the present invention.

Fig. 3 is a perspective view illustrating the appearance of the terminal connection apparatus of Fig. 1 or Fig. 2.

~~Fig. 4 shows Figs. 4A and 4B are respectively a side view and a front view of an electromagnetic contactor using the terminal connection apparatus of Fig. 1 and Fig. 2. Fig. 4 (A) shows the side view while Fig. 4 (B) shows the front view of Fig. 1 or Fig. 2.~~

~~Fig. 5 shows Figs. 5A - 5C show a wiring diagram of a tripolar electromagnetic contactor using the terminal connection apparatus. Fig. 5 (A) shows apparatus, where Fig. 5A shows motor reversible operation, Fig 5(B)5B shows load switching, and Fig. 5 (C)5C shows power source switching.~~

~~Fig. 6 shows Figs. 6A and 6B are respectively a side view and a front view of an electromagnetic contactor using a conventional terminal connection apparatus. Fig. 6 (A) is the side view and Fig. 6 (B) is the front view.~~

~~Fig. 7 shows Figs. 7A, 7B and 7C are respectively a side view, a front view and a lower face view of a terminal connection conductor in a conventional terminal connection apparatus. Fig. 7 (A) is the side view, Fig. 7 (B) is the front view, and Fig. 7 (C) is the lower face view.~~

Figs. 8A, 8B and 8C are respectively a side view, a front view and a lower face

~~Fig. 8 shows view of a different terminal connection conductor in a conventional terminal~~

~~connection apparatus. Fig. 8 (A) is the side view, Fig. 8 (B) is the front view, and Fig. 8 (C) is the lower face view.~~

**(Description of Reference Numerals)**

- 1 — Electromagnetic contactor
- 2 to 7 — Terminal connection conductor
- 9 — Interlock apparatus
- 10 — Insulation material
- 11 — Insulation case
- 12 — Insulation case body
- 13 — Insulation case cover body

**Best Mode for Carrying out the Invention**

**Detailed Description of the Preferred Embodiment**

Hereinafter, with reference to ~~Fig. 1 to Fig. 4, Figs. 1 to 4B~~, an embodiment of this invention will be described. Fig. 1 is an exploded perspective view of a terminal connection apparatus of a phase switching connection. Fig. 2 is also an exploded perspective view of a terminal connection apparatus of phase order connection. Fig. 3 is a perspective view illustrating the appearance of the apparatus of Fig. 1 or Fig. 2. Fig. 4 (A)~~4A~~ is a side view of an electromagnetic contactor for reversible operation using the apparatus of Fig. 1 or Fig. 2. Fig. 4 (B)~~4B~~ is the front view. In the drawings, the same components as those of the conventional example are denoted with the same reference numerals.

In Fig. 1 and Fig. 2, the terminal connection conductors 2 to 7 each consist of a U-shaped conductor pressed out of a plate material and both ends thereof are bent to have a

at a right angle to provide terminal sections 2a to 7a. The conductor part, except for the terminal sections 2a to 7a, is covered by ~~the~~an insulation material 10 consisting of a

thermal contraction tube. ~~This~~The insulation covering 10 covers, as shown in the drawing, only up to the middle of the U-bend part of the conductor for the minimum covering required to provide the interphase insulation of the terminal connection conductors 2 to 7, thus suppressing wrinkles caused at ~~the~~to 7. This suppresses the creation of wrinkles during thermal contraction.

The terminal connection conductors 2 to 7 for a plurality of phases (three-  
~~(tripolar~~phase in the drawing) are collectively surrounded, except for the terminal sections 2a to 7a, by the insulation case 11 consisting of a molded resin. The insulation case 11 consists of a box-shaped body 12 having at the upper face an opening, and a plate-shaped cover body 13 for covering the opening. The upper edge of the front face of the body 12 has six notches 12a engaged with the terminal sections 2a to 7a of the terminal connection conductors 2 to 7 ~~and the~~7. The center of the front face and both ends thereof have an engagement section 12b engaged with the cover body 13. On the other hand, the cover body 13 has, at the front edge thereof, six ~~convex~~protruding sections 13a engaged with the notches 12a of the body 12 and an engagement nail 13b is ~~projections~~provided to correspond to the engagement section 12b of the body 12.

As shown in Fig. 1 and Fig. 2, the above-described terminal connection conductors 2 to 7 are attached by superimposing them so as to be parallel to one another in the ~~plate thickness~~direction of plate thickness, to insert them ~~to~~in the body 12 while engaging the terminal sections 2a to 7a with the notches 12a, after which the ~~convex~~section 12a. Then, the protruding 13a ~~is~~are engaged with the notches 12a to engage the cover body 13 to the opening of the body 12, thereby engaging the engagement nail 13b to the ~~projection~~projection 13b with the engagement section 12b in a snap fit manner. As a result, the terminal connection conductors 2 to 7 housed in the body 12 are positioned by the notches 12a via the terminal sections 2a to 7a and are pressed and fixed by the cover body 13. This allows the terminal connection conductors 2 to 7 for the

respective phases to be integrally unitized via the insulation case. Fig. 3 shows the terminal connection apparatus unitized in this manner.

The terminal connection apparatus of Fig. 3 in this condition is placed on the two electromagnetic contactors+, 1 shown in Fig. 4 to be connected as shown in the manner shown to bridge the spaces of the terminals for the respective phases. In Fig. 4, the upper side is the power source side to which the terminal connection apparatus of a phase order connection type shown in Fig. 1 is connected, while the lower side is the load side to which the terminal connection apparatus of phase switching connection type shown in Fig. 2 is connected. As a result, the left and right electromagnetic contactors+, 1 are alternately turned ON as described above, thereby switching the positive/negative normal/reverse operation of a motor (not shown). In Fig. 4, the terminal connection apparatus is tightened to the main terminal of the electromagnetic contactors+, 1 via the block terminal 14, as shown in Fig. 4. This structure will be not described in detail because the block terminal 14 is irrelevant not material to the present invention.

~~When compared to the conventional techniques, With reference to the described embodiment, the terminal connection conductor of the invention has the following advantages over the conventional shown embodiment has the advantages as shown below structures.~~

(1) The terminal connection conductors 2 to 7 are collectively surrounded by the insulation case 11. This prevents, even when the terminal connection conductors 2 to 7 have an exposed conductor, an accident (e.g., the insulation case 11. This prevents accidents, such as short-circuiting caused when the exposed part is adhered with foreign material or an electric shock due to contact with a finger), with a finger, even when the terminal connection conductors 2 to 7 have an exposed conductor.

(2) For the same reason as describe in (1) above, the terminal connection conductors 2 to 7 can have an exposed conductor to the maximum allowable limit in terms of preventing interphase short-circuiting, thus suppressing wrinkles from (2) Due to the

~~reason shown in the above (1), the terminal connection conductors 2 to 7 can have an exposed conductor to the maximum allowable limit in terms of preventing interphase short circuiting, thus suppressing, even when a thermal contraction tube that can be covered easily is used, wrinkles caused by the thermal contraction by minimizing the insulation covering of the U-bend part of the conductor. conductor, even when a thermal contraction tube that can be covered easily is used.~~

(3) The terminal connection conductors 2 to 7 can be connected to the electromagnetic contactor 1 while being unitized in an integral manner, thus simplifying the wiring operation and preventing it from being performed incorrectly. (3) The terminal connection conductors 2 to 7 can be connected to the electromagnetic contactor 1 while being unitized in an integral manner, thus preventing an incorrect wiring operation and simplifying the wiring operation.

(4) The insulation case 11 is entirely sealed and thus the insulation at the inner side is protected from deterioration. (4) The insulation case 11 is entirely sealed and thus the insulation at the inner side is prevented from being deteriorated.

(5) The box-shaped insulation case 11 only surrounds the terminal connection conductors 2 to 7 from the exterior, and does not have complicated rib or grooved structures, so that it easily can be resin-formed and made resistant to deformation. (5) The box-shaped insulation case 11 only surrounds the terminal connection conductors 2 to 7 from the exterior and does not have complicated rib or grooved structures, thus can be easily resin-formed and be resistant to deformation.

(6) The box-shaped insulation case 11 can be commonly used for both of the phase order connection and the phase switching connection. (6) The box-shaped insulation case 11 can be commonly used for both of the phase order connection and the phase switching connection.

#### Industrial Applicability

~~As described above, according to this invention, terminal connection conductors for a plurality of phases are collectively surrounded by the insulation case in a unitized manner. This enables the insulation to be completely protected while simplifying the insulation covering of the terminal connection conductors, and can prevent an incorrect wiring operation and improve the workability in various operations.~~

図 1

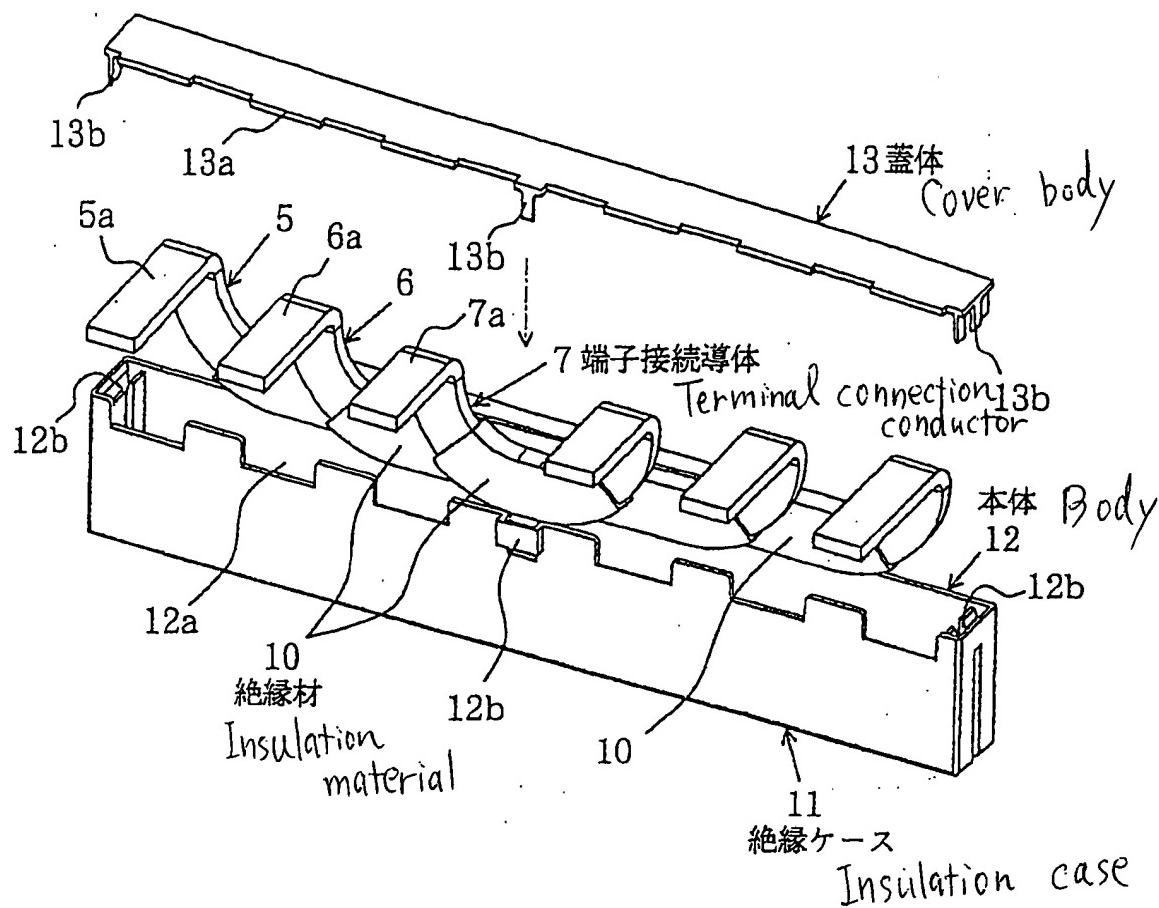


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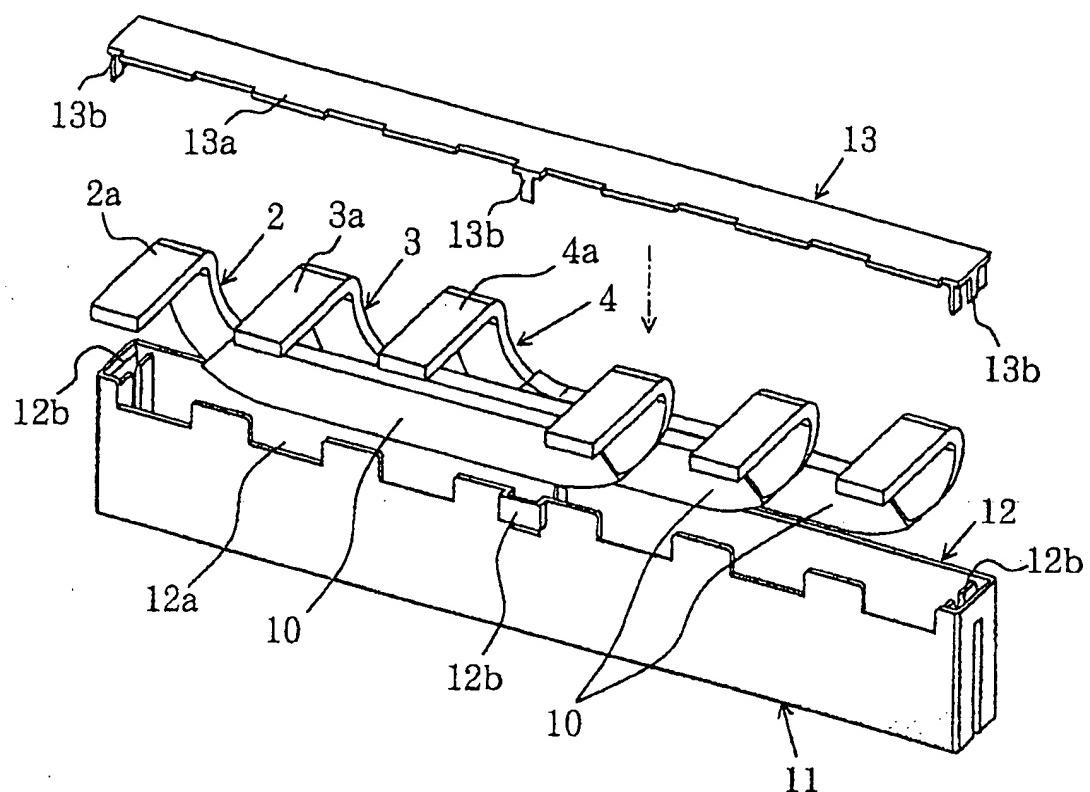


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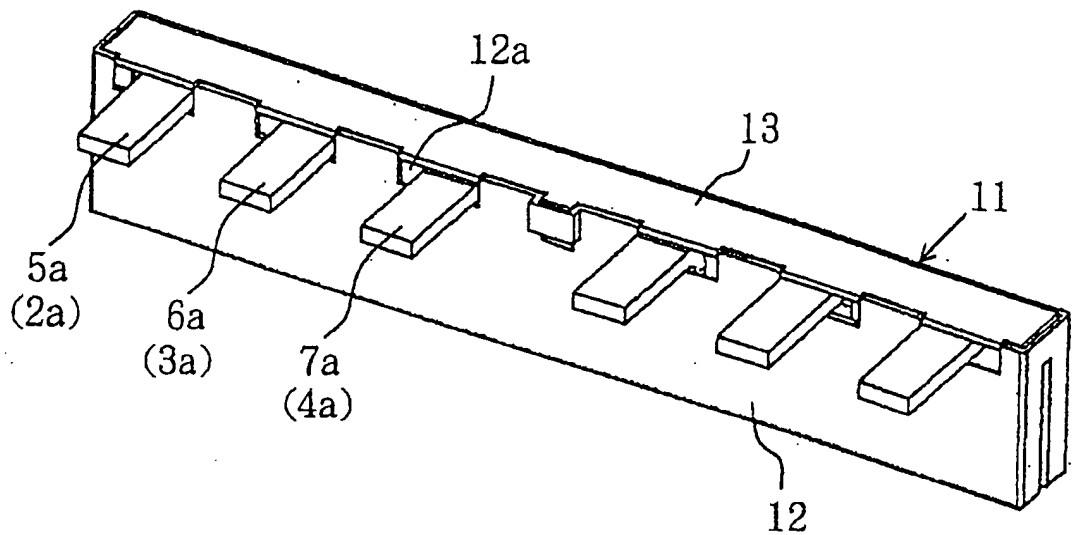


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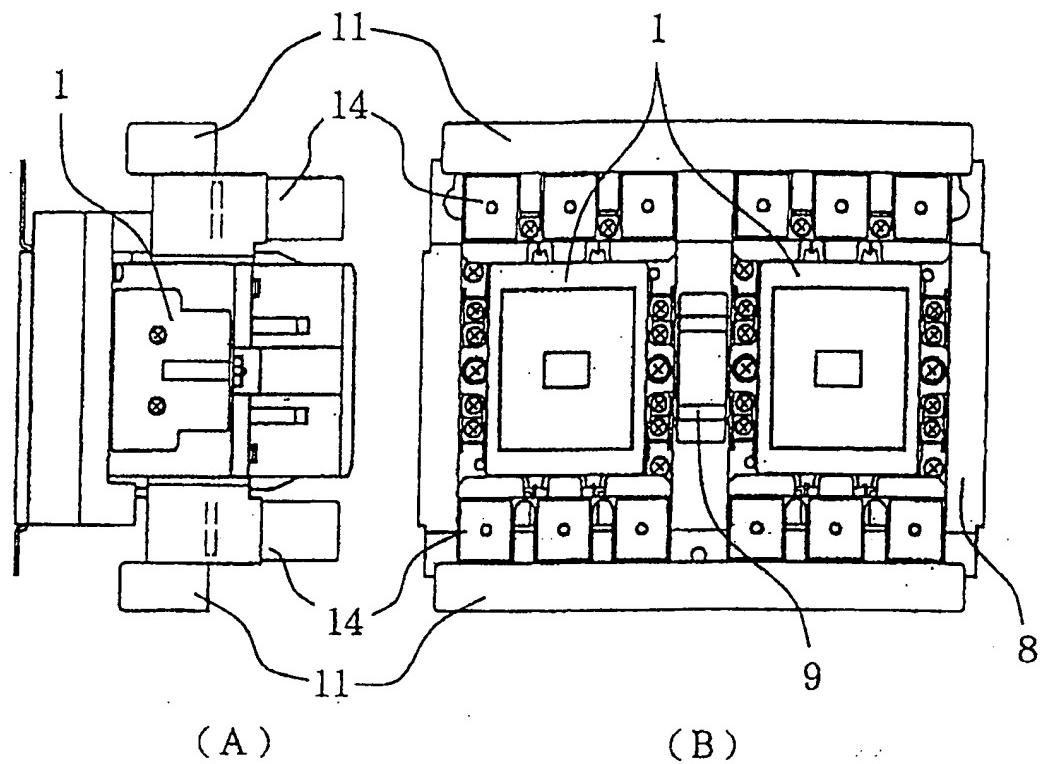


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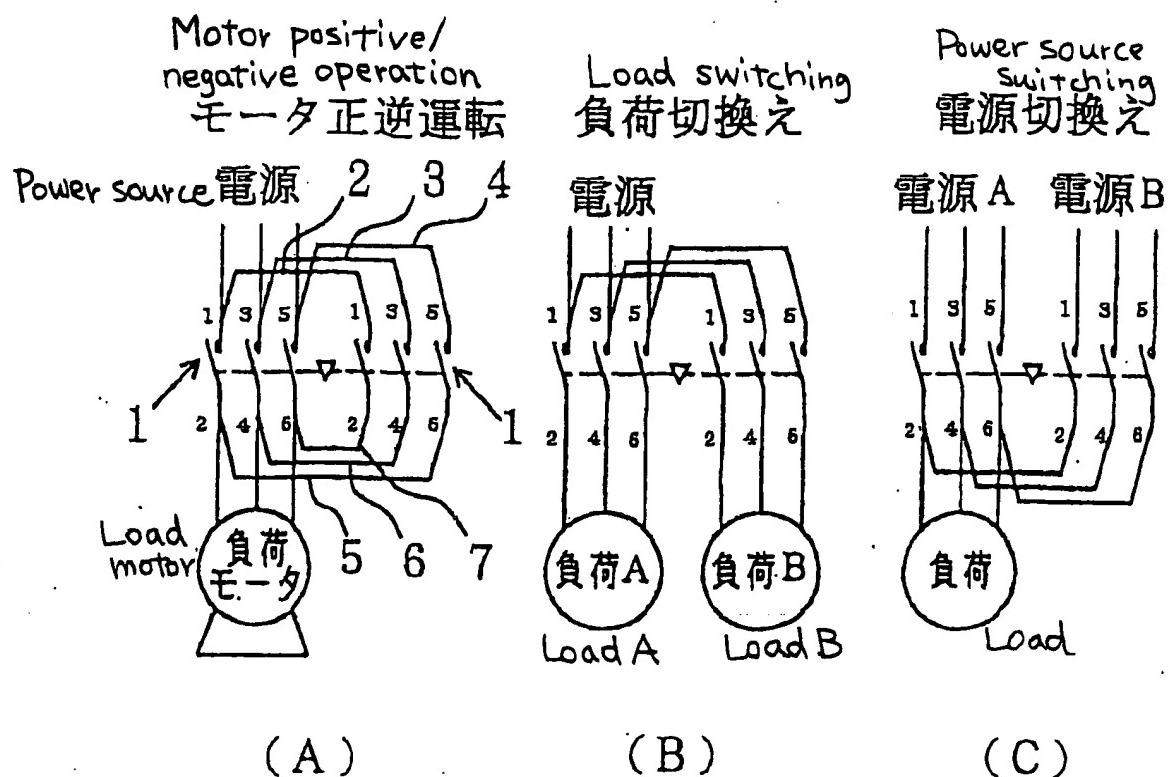


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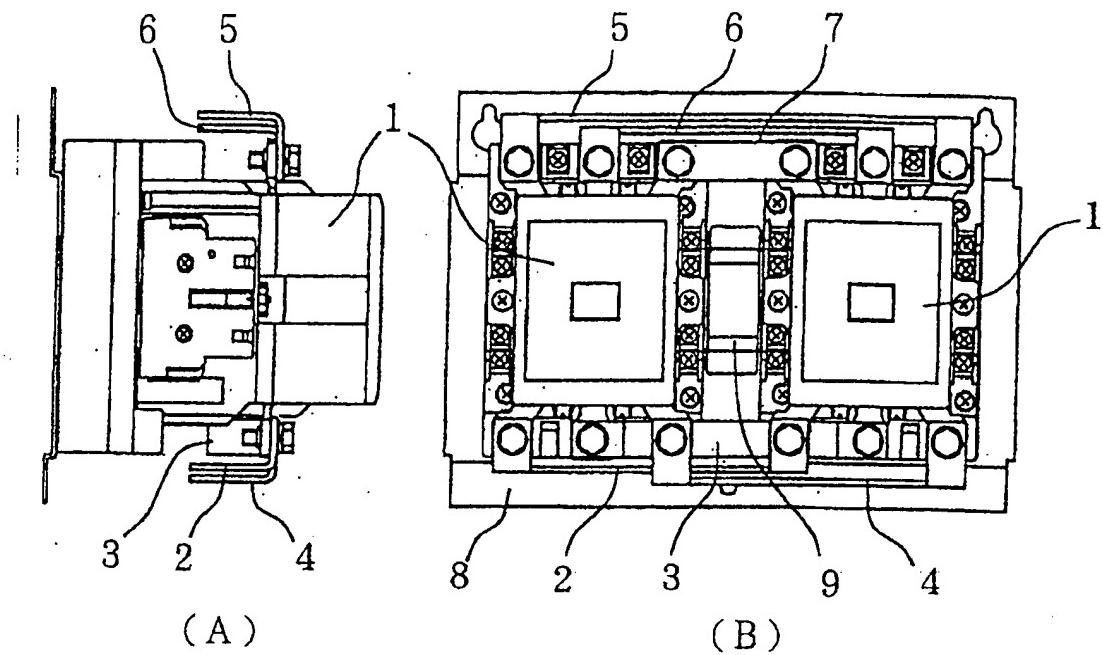


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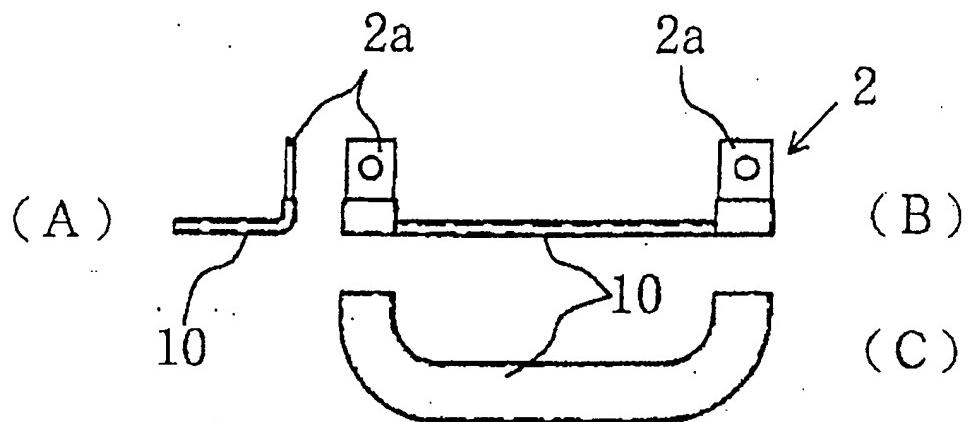


図 8

